

Appln No. 10/632,347
Reply to Office action of September 27, 2006

REMARKS/ARGUMENTS

An Office action dated September 27, 2006 contained the following objections and rejections:

- claim 12 is objected to on formal grounds;
- claims 1, 2, 4, 6, 7, 9, 11 and 12 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 6,122,537 to Schmidt (the Schmidt patent); and
- claims 16 - 18 were rejected under 35 U.S.C. §103(a) as being obvious in light of the Schmidt patent.

Objection to claim 12

Applicants respectfully submit that the amendment to claim 12 to depend from claim 11 has overcome the objection.

Claim 1

Claim 1 was rejected as anticipated by the Schmidt patent. The Office action states that the "respiratory and heart rate movements disclosed in Schmidt'537 are considered to be indicative of time dependent variations in the complex impedance with respect to the electrical activity of the subject's heart, because the pulse (hear rate) is indeed indicative of a heart's movement and thus tied to the electrical activity of the heart. Therefore Schmidt'537 is considered to disclose a device which includes a detector configured to extract from the reflected signal beam variations in amplitude that are indicative of time dependent variations in the complex impedance with respect to the electrical activity of the heart" (Office action, p. 3).

Applicants respectfully disagree with the Office action's characterization of the Schmidt patent. As outlined in the Amendment dated March 29, 2006, the Schmidt patent uses modulations of the phase and/or frequency of a reflected microwave signal caused by physical motion of the chest to extract information about respiration and pulse. Therefore, Applicants respectfully submit that the Office action's statement that

the systems described in the Schmidt patent monitor amplitude changes is incorrect. The portion of the specification of the Schmidt patent that is cited in support of the proposition that the Schmidt patent monitors amplitude changes is as follows:

The signal-noise ratio determines the sensitivity limit, in the case of direct detection. For the respiration rate, SN values of over 46 dB were achieved, while for the heart rate, values of 26 dB were achieved at a distance of 3 mm and with oscillator powers of about 5 nW.

On the assumption that the heart emits spherical waves, between the transmission and reception powers, there is a relationship which is inversely proportional to the second power of the distance. Therefore, for the ratio of the amplitudes of the respiration rate UA to the noise UN or the heart rate UH to the noise, it is possible to estimate that the reception limit with a transmission power of 1 W is then at about 50 m in relation to the heartbeat and at typically 160 m in relation to respiration.

(Schmidt, col. 5, lines 17 - 30)

Applicants respectfully submit that the above excerpt does not discuss extracting information from the amplitude of the reflected signal. Instead, the excerpt discusses the signal to noise ratio of the reflected signal related to respiration and heart rate. The manner in which information is extracted from the reflected signal is discussed in the following excerpt from the Schmidt patent:

The reflected signal is phase or frequency modulated ...

The phase-modulated signal is impressed on the non-linear characteristic, and that results in currents which are proportional to the phase modulation frequency Ω and the multiples thereof $k^*\Omega$. The curve shape of the modulation is not retained, in consideration of the demodulation principle, but it has been found that those changes in the curve shape are not critical for most uses according to the invention as detection of the modulation can be sufficient for such uses.

(Schmidt, col. 4, line 53 - col. 5, line 16)

The above excerpt states that the information extracted by the Schmidt system is a current "proportional to the phase modulation frequency". The statement that the "curve shape of the modulation is not retained" indicates that the system described in

the Schmidt patent does not extract information from the amplitude of the reflected signal. Indeed, Schmidt states that "changes in the curve shape are not critical for most uses according to the invention as detection of the modulation can be sufficient for such uses." All of the discussion in the Schmidt reference is to analysis of the signal in the frequency domain. What is clear from the above excerpt is that the Schmidt reference does not involve analysis of the signal in the time domain or the extraction of information from the amplitude of the received reflections.

Applicants respectfully submit that the fact the Schmidt patent discards information concerning the amplitude of the reflected signal in preference of information concerning the phase modulation means that the Schmidt patent does not teach the following combination of claim 1 (emphasis added):

1. A remote-detection system for monitoring changes in complex impedance associated with physiological activity of a subject, comprising:

a source containing an oscillator configured to illuminate at least a portion of the subject with an electromagnetic signal beam; and

a receiver configured to receive reflections of the electromagnetic signal beam from the subject;

a detector connected to the receiver and configured to extract from the reflected signal beam variations in amplitude that are indicative of time dependent variations in the complex impedance with respect to the electrical activity of the subject's heart.

In addition, Applicants submit that the Schmidt patent cannot render the combination in claim 1 obvious on the basis that the Schmidt patent teaches that the "curve shape of the modulation is not retained", which is a teaching away from the above combination. Accordingly, claim 1 is submitted to be allowable in light of the prior art of record.

Claims 2, 4, 6 and 15 - 17

Claims 2, 4, 6 and 15 - 17 depend from claim 1. Applicants respectfully submit that claims 2, 4, 6 and 15 - 17 are allowable for reasons including that they depend from an allowable base claim.

Claim 7

For reasons similar to those set above with respect to claim 1, Applicants respectfully submit that claim 7 is allowable on the basis that the prior art of record neither anticipates nor renders obvious the combination in claim 7 of:

7. A remote-detection system for monitoring the physiological activity of a subject, comprising:

means for illuminating at least a portion of the subject with an electromagnetic signal;

means for detecting reflections of the electromagnetic signal; and

means for extracting a signal indicative of the changes in the amplitude of the electromagnetic signal reflected by the subject that are associated with time dependent changes in the complex impedance with respect to the electrical activity of the subject's heart.

Claim 9

For reasons similar to those set above with respect to claim 1, Applicants respectfully submit that claim 9 is allowable on the basis that the prior art of record neither anticipates nor renders obvious the combination in claim 9 of:

9. A method of observing changes in the complex impedance of a subject associated with physiological activity, comprising:

illuminating at least a portion of the subject with an electromagnetic signal beam; and

extracting from the reflected signal a signal indicative of the changes in the amplitude of the electromagnetic signal reflected by the subject that are associated with time dependent changes in the complex impedance with respect to electrical activity of the subject's heart.

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Claims 11, 12 and 18

Claims 11, 12 and 18 depend from claim 9. Applicants respectfully submit that claims 11, 12 and 18 are allowable for reasons including that they depend from an allowable base claim.

Conclusion

For reasons including those outlined above Applicants respectfully submit that all of the currently pending claims are allowable. Therefore, Applicants request the prompt issuance of a Notice of Allowability.

If Applicants' counsel can be of any assistance, please do not hesitate to contact them at the number listed below.

The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§1.16 and 1.17 which may be required by this paper to Deposit Account No. 03-1728. Please show our docket number with any charge or credit to our Deposit Account.

Respectfully submitted,
CHRISTIE, PARKER & HALE, LLP

By _____

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626/795/9900

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